



# Tailoring smart irrigation strategies for white wine grapes in eastern Washington

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## Introduction

Irrigation guidelines in arid climates are optimized for increasing the quality of red wine grape varieties, by for example increasing sun exposure and reducing berry size through controlled water deficit periods. However, the standards and quality goals of red grapes differ significantly from the objectives desired for white grapes.

Reduced berry size is desired in red grapes to increase the skin-to-volume ratio and extract compounds of interest



Berry size is less important in white grapes because skin components are not usually extracted during the winemaking process

Increased sun exposure leads to an upregulation of phenolic compounds and anthocyanin gene expression, which is desirable for red grapes

Increased sun exposure generally promotes higher concentrations of flavonoids, leading to undesirable levels of bitterness in white wines

Three irrigation treatments: **FULL** (control or well-watered vines), **RDI** (regulated deficit irrigation) and **PRD** (partial rootzone drying) were tested to determine whether partial rootzone drying could stand as a better irrigation strategy for growing white wine grapes in the Yakima Valley. The objective was to assess specific timings and severity of water deficit to avoid compromising yield while improving fruit quality and resource-use efficiency in white wine grapes grown in arid climates like eastern Washington.

The irrigation management was broken down into three periods with the following specifications by treatment along the growing season:

### Soil moisture (SM) irrigation targets for each treatment and period of the growing season

Period 1: Budbreak to fruit set	Period 2: Fruit set to veraison	Period 3: Veraison to harvest
<b>FULL:</b> Control/well watered vines. Target: 17% v/v SM. <u>No water stress</u>	<b>FULL:</b> Control/well watered vines. Target: 17% v/v SM. <u>No water stress</u>	<b>FULL:</b> Control/well watered vines. Target: 17% v/v SM. <u>No water stress</u>
<b>RDI:</b> Well watered vines. Target: 17% v/v SM. <u>No water stress</u>	<b>RDI:</b> Deficit irrigation period. Target: 11% v/v SM. <u>Mild water stress</u>	<b>RDI:</b> Well watered vines. Target: 17% v/v SM. <u>No water stress</u>
<b>PRD:</b> Well watered vines. Target: 17% v/v SM. <u>No water stress</u>	<b>PRD:</b> Alternating irrigation to generate a dry (11% v/v SM) and a wet (17% v/v SM) rootzone side. <u>Mild water stress</u>	<b>PRD:</b> Alternating irrigation to generate a dry (11% v/v SM) and a wet (17% v/v SM) rootzone side. <u>Mild water stress</u>

## Material and methods

The irrigation trial consisted of 3 treatments replicated 4 times in complete randomized blocks in a Riesling experimental vineyard (Prosser, WA). Fruit composition parameters (total soluble solids, pH, T.A) were measured at harvest. The fruit was shipped to the Wine Science Center (WSC) – WSU for winemaking and sensory evaluation.

## Figures

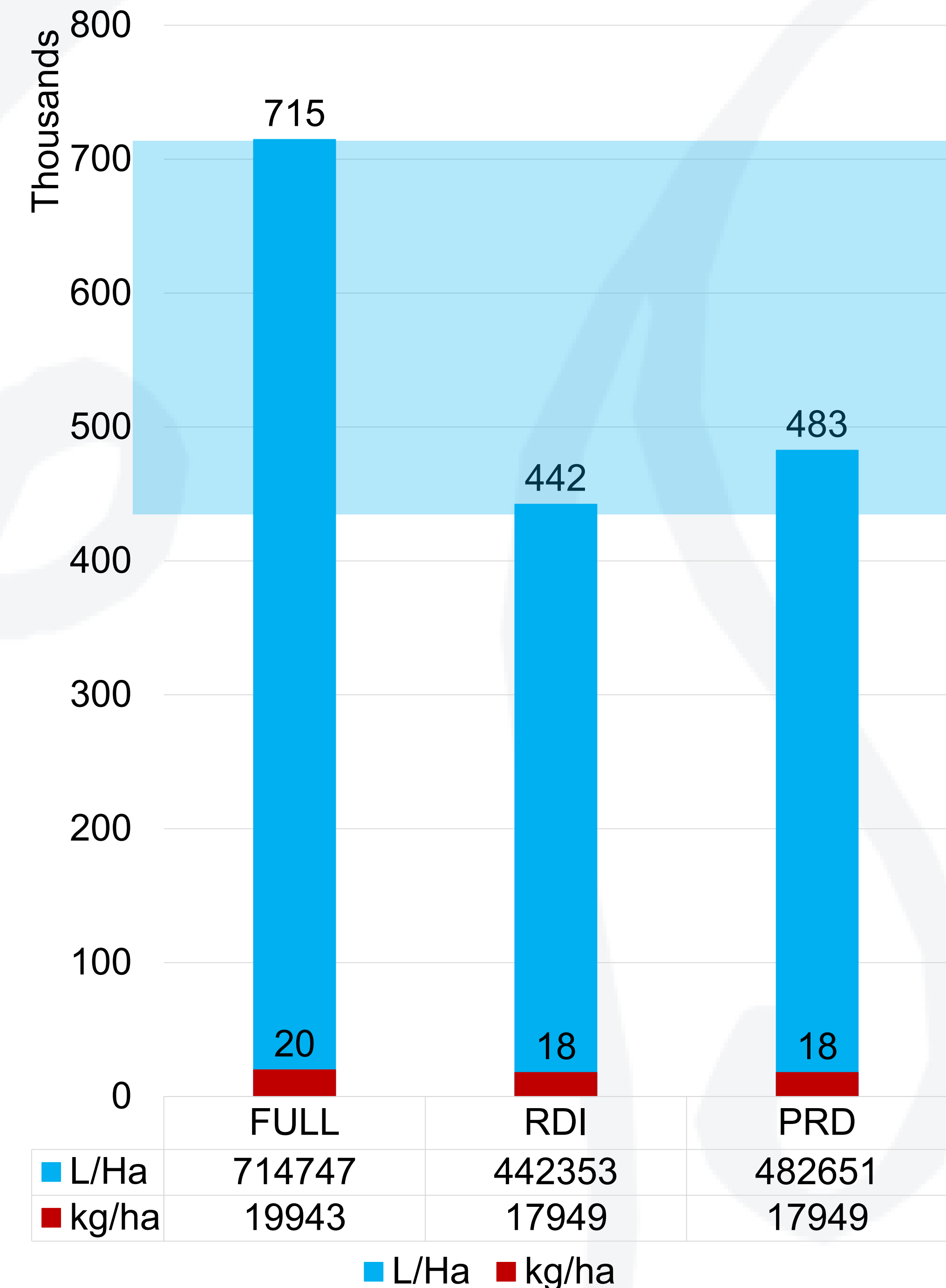


Figure 1: Seasonal irrigation input per treatment and yield for the 2019 growing season.

## Tables

Table 1: Canopy architecture-related parameters at harvest 2019. Data analyzed with One-Way ANOVA and LSD multiple range test. Different letters indicate different means with 95% of confidence

Parameter of interest	FULL (Control)	RDI	PRD	P-value
Lateral leaves*	19 <b>ab</b>	20 <b>a</b>	16 <b>b</b>	0.045*
Lateral shoots*	10 <b>a</b>	10 <b>a</b>	9 <b>b</b>	0.029*
Fruit zone light exposure (umol/m <sup>2</sup> s)	283	298	260	0.413

Table 2: Water use and water use efficiency (W.U.E) during 2019 growing season. Data analyzed with One-Way ANOVA and LSD multiple range test. Different letters indicate different means with 95% of confidence

Parameter	FULL	RDI	PRD	P-value
L/vine	1649 <b>a</b>	1020 <b>c</b>	1113 <b>b</b>	0.000*
Kg/vine	10	9	9	0.216
Kg/L (W.U.E)	0.006 <b>b</b>	0.008 <b>a</b>	0.008 <b>a</b>	0.004*

Table 3: Fruit maturity analysis per treatment in 2019. Data analyzed with One-Way ANOVA and LSD multiple range test. Different letters indicate different means with 95% of confidence

Parameter	FRUIT ANALYSIS			Significance
	FULL	RDI	PRD	
Total soluble solids (Brix)	20	18	19	0.461
pH	3.3	3.3	3.3	0.535
Titrateable acidity (g/L)	7.5	7.8	7.5	0.357

Table 4: 2018 Riesling irrigation trial wine tasting notes. \*Note that these results are preliminary, and an official blind tasting with trained panelists is still pending.

FULL	RDI	PRD
Floral, mineral, lemon, gooseberries, slight peach and pineapple, good mouthfeel	Less fruity and floral aromas, still smell not objectionable. Strong bitter aftertaste	nice floral and mineral aromas, fine texture, light, pleasant apple finish

The wines made from the different treatments show some subtle differences. A formal sensory evaluation should be performed in order to extract valid conclusions.

**Conclusions:** Partial rootzone drying allows reducing water use while maintaining yield without changing quality parameters in white wine grapes grown in eastern Washington. A formal blind tasting with trained panelists is still pending, but preliminary results suggest differences in the wine profiles between irrigation treatments.